Volume 16 Number 1 March 2004

ISSN 1013-3445

CONTENTS

The *Zimbabwe Journal of Educational Research* (ZJER) is published tri-annually by University of Zimbabwe (UZ), Human Resources Research Centre (HRRC).

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Single copies: ZW$12,000

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UTILISAT ION OF RESOURCES AT SCIENCE AND MATHEMATICS CENTRES IN ZIMBABWE

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Abstract

This paper reports on a research carried out to obtain information on the usefulness of Science and Mathematics Centres (SMCs) in Zimbabwe. Interviews and questionnaires administered to the regional directorate and A-level teachers addressed the following aspects: accessibility of SMCs, use of materials at the SMCs, SMC workshops attendance, support to access the SMCs, networking, and development of curriculum materials. 73.8% of the respondents indicated that the SMCs were easily accessible. Those in rural areas found the centres not to be accessible in terms of distance. The A-level teachers mainly come to the SMCs when invited for workshops. Only 47.1% of the respondents are using the resources at the centre, and it is mainly the photocopier which is used. There is no deliberate move to enhance teacher networking in the regions. It is recommended that the SMCs be made more accessible, teachers be afforded a chance for computer literacy courses, and SMC management committees should have aggressive advocacy campaigns so that intended users are aware of what is offered at the centres and the resources that are available.

Introduction

In an endeavour to improve the quality of science and mathematics education in Zimbabwe, the Ministry of Education, Sport and Culture and the Science Education In-Service Teacher Training (SEITT) programme at the University of Zimbabwe set up ten regional SMCs in the country. These SMCs are viewed as structures that accommodate resources, stock exemplary teaching materials, communication centres, centres that facilitate teaching skills acquisition, facilitate production of materials and, as a concept, are agents of change.

Teacher centres have been set up elsewhere in the world with the thrust of improving the quality of science and mathematics teaching and learning through in-service teacher training. According to Howey (1980), centres address more seriously the notion of the three 'I's, that is initial education, induction and in-service education. The Kohl centres (in Israel) serve as workshop places and have been organising more structured programmes where teachers can attend talks on various

class related subjects. Workshops also offer forums for examining new teaching styles, evaluating current methods and becoming acquainted with, and proficient at, the methods (Howey, 1980). In the USA, science centres made the following achievements: there were in-service activities which were directed at teacher-identified needs, teachers were actively involved as in-service agents, on a voluntary basis, emphasis was placed on materials development, and these centres were able to serve individual as well as group needs. From the centres that were developed in the UK (Yarger & Leonard, 1974) came the following observations: centres created commitment of teachers to the development of work, the outcome was classroom based and the changes took place within the teachers' own framework. The In-Servive Training and Asistance for Namibian Teachers (INSTANT) project made strides in in-service activities focussing on training teachers to become competent and confident in basic teaching skills required for effective teaching and also learner centred aspects of instruction (De Feiter, Vonk & Van Den Akker, 1995). In the case of the INSTANT project, there was a mammoth task in changing teacher attitudes and creating an appreciation for in-service training (De Feiter, Vonk & Van Den Akker, 1995). Involvement of teachers in curriculum materials development is seen as an opportunity for their further professional development. Following this trend, several projects in the southern African region, such as the Matsapha Project in Swaziland (Lubben *et al*, 1998), the Science Through Applications Project (STAP) project in Western Cape (Gray and Ramahlape, 1998) and the Linking School Science with Industry and Technology (LISSIT) project in Swaziland (Lubben *et al*, 1998) have involved teachers in the design and classroom testing of curriculum materials. Each of the development initiatives listed above have shown that when brought together, teachers can interact meaningfully.

In Zimbabwe, SMCs are central to the operations of the SEITT programme in the regional settings. SMCs can provide a framework and platform for thinking about how teaching the subject matter can make a difference in the pedagogical knowledge of content. The extent to which the SMCs facilitate these areas constitute the subject of this investigation.

Methodology

The data was collected from the SMCs users and administrators. This being a qualitative study, interviews and questionnaires were used to collect data. Questionnaires (five per school) were sent to 50% of the A-level schools (50

schools) in all the 10 regions in the country. Interviews were carried out with the following: all the Regional Directors or Deputy Regional Directors, 90% of the Education Officers in charge of SEITT, 10 heads of schools which house the SMCs and their heads of science and mathematics departments, three other School Heads and their heads of departments per each region.

Questionnaires administered to the A-level teachers focussed on accessibility, use of materials at the SMCs, SMC workshops, support by the school head or authority to access the SMC, networking and development of curriculum materials. Interviews addressed the aspects of support on the programme, monitoring of SMC activities and general efficacy of the SMCs.

Results and Discussion

A total of 144 (i.e. 57.6%) questionnaires were returned and of these 15 (i.e. 10.4%) had indicated that they were not aware of SMCs and, therefore, could not respond to the questionnaire. These were not included in the analysis of the data. The other 12 came when the data had been analysed and were not included in this report. The results from the teacher's questionnaires are presented in Table 1, and are discussed under specific themes together with interview results.

Table 1: Summary of Teachers' Responses

Themes	N	Agree (%)	Disagree (%)
Accessibility of SMCs	117	73.8	26.2
Use of SMC teaching material	104	47.1	52.9
Attend SMC workshop	112	82.2	17.8
Support to access SMCs	112	88.8	11.2
Networking	116	66.8	33.2
Development of curriculum materials	108	83.8	16.2

Accessibility of Science and Mathematics Centres

Table 2 shows the responses from the interviewees. 73.8% of the teachers indicated that they find it easy to access the equipment and materials at SMCs. These teachers have easy access to the centres as they felt the SMCs were centrally located. During time of data collection 7/10 of the SMCs had resident resource teachers, who had full teaching loads. This means that, at such centres, materials are accessible with prior arrangements or during the times set by the resident resource teacher when he/she is not teaching. Only one SMC had a full-time attendant, and trained resource teachers had a duty roaster to attend to professional needs of the teachers. This particular SMC is open during normal working hours and the attended is paid from subscriptions by the schools in the region. The other two SMCs had no resident resource teacher during the time of data collection which made use of the materials difficult. These results show that for materials to be easily accessible by the intended users, there is need for a full-time attendant or a resident resource teacher with a reduced work load. This will make the materials more accessible as the SMCs will be open at all times so that the teachers can access the SMCs for materials. There are some teachers who are about 400km from the SMCs and for such schools there is needs for management committees in the regions to think of satellite centres so that schools which have problems in accessing the SMCs are not inconvenienced. Cost of visiting the SMCs are prohibitive and that could be the other reason why the materials are being under utilised. The teachers not visiting the SMCs gave reasons like costs of travelling, resident resource teacher is busy when they are free, resident resource teacher is arrogant, and their schools have better equipment than those at the centre.

Some teachers are said not to be visiting the SMCs because their schools are better equipped. The management committees need to 'sell' the SMCs concept to the intended user and that SMCs are not only about equipment, but also teacher collaboration. From the study, it is clear that teachers are finding workshops useful, though they may not be coming for materials at the centre. This means that even well equipped schools can come for collaborative work.

Figure 1: Interviewee's Comments on SMC Accessibility

Seitt Trained Resource Teachers	School Heads/ Heads of Departments	Regional Directors/ Deputy Regional Directors/ Education Officers
• Teachers find it easy to access the equipment at the SMCs • Centre manned by a full-time attendant, so it's easy to access • Provisions are in place to assist visiting teachers • Centres manned by trained resident resouce teacher are accessible during scheduled times • Centre has no manager so it's difficult to access equipment • Teachers can visit centre during scheduled times	• Accessibility is not a problem though teachers do not visit SMC more often • SMCs are manned by full-time teachers, who may not have enough time to attend to teachers visiting the centres • Laboratory technicians at times assists teachers visiting the SMC when the RT is busy in the classroom • Not conveniently accessible, when SMC is open other teachers may be busy in their classrooms	• Very accessible because of centrality • Opening hours are convenient • The SMC could not have been at a better place, the facilities are easy to access • Prior arrangements are necessary before one pays a visit
Reasons for visiting SMCs		
• To use the photocopier • Reference to textbooks and journals • When invited for workshops • To use the Internet	• To photocopy materials • To consult text books • To discuss with colleagues	• To use the Internet • To photocopy materials • To use the library • To source science equipment
Reasons for not visiting SMC		
• Prohibitivedistance • Their schools are better equipped • Time constraints • School heads can not release all science teachers for a workshop on the same day • Rural teachers have limited time during the week	• Time constraints • Fuel problems • Internet is not yet working • Financial constraints as teachers have to travel long distances • Head of school may not be aware of the importance of such visits so teachers are not released	• Teachers might not be very sure of what is available at the SMC • Lack of information leads to teachers not visiting the SMC • Busy time schedules • Cost of travel to SMC prohibitive • Location of the SMC may not be attractive • Prohibitive distance

Use of Teaching Materials

On the use of teaching materials, interviewees indicated that at the centre, teachers mainly come to photocopy materials and make use of the Internet. The regional directorate wished if they could have more computers hooked on to the Internet. Though the regional directorate would wish to have more computers, it seems as if the Internet facilities are not very reliable and that the teachers are not making use of the computers, which could be due to computer illiteracy. Hence to maximise use of the materials at the SMCs, the teachers need to be aware of what the SMCs offer and also computer courses. The materials are being widely used by trained resource teachers in the regions, teachers at the centre and teachers close to the centres. This is because it has become expensive for teachers from remote areas to travel to the SMCs for materials.

Questionnaire responses indicate that 47.1% of high school science and mathematics teachers are making use of the teaching materials, while 52.9% are not. Amongst the 47.1%, the majority makes use of the photocopier. 25.5% have used the computer for word processing. Other teachers use the computer for e-mail.

The interviewed resource teachers and education officers also observed that the teachers made extensive use of the photocopier and limited use of the computer. The photocopier is used to photocopy textbooks and journal articles, while the computer is mainly used for communication and Internet browsing. Heads of science and mathematics departments also pointed out that teachers made use of photocopier to photocopy past examination papers. The computer is used for the Internet and word processing, for instance, setting examinations. The photocopiers in the regions cannot cope with the large volumes of work that is why they are always down, and servicing them is very expensive. There is need to buy heavy duty machines.

In the foregoing discussion, it is evident that, for some reasons, teachers are not fully utilising the SMCs teaching materials as expected of them. The maximum use of these materials goes a long way in improving classroom instruction. Resource teachers, therefore, have a challenge to meet the technical needs of these teachers. All the stakeholders have the task of ensuring that SMCs fully service teachers as per their design and location.

SMC Workshops

Figure 2: Commented on Success and Usefulness of SMC Workshops

Resource Teachers	School Heads/ Heads of Departments	Regional Directorate
• Support given by heads of schools shows that the workshops have been useful • Workshops are done after needs assessments • Evaluations are done at the end of each workshop • Teachers help to identify resource persons • Teachers bring useful items for the benefit of colleagues • Agenda is circulated in advance and this increases participation • Workshops are done on Fridays	• Have attended one/two workshops and found them to be useful • Co-ordination done with EO science who invites teachers for workshop • Host head participates in official capacity to welcome participants • Success depends on organisers	• Supervises happenings at the SMCs and monitors teachers • Ensures workshops are based on needs analysis so that they are useful and gets feedback from teachers • Effectiveness assessed through evaluation at end of each workshop • EO science is a member of the management committee

The majority of A-level teachers who responded to the questionnaire (82.2%) have attended SMC organised workshops and the 17.8% have not. Those who attended found the workshops to be very useful. Some of the teachers who have not attended SMC activities indicated that they were not aware of SMC. This shows lack of advocacy on the part of SMC management committees. There is need to have an aggressive advocacy programme targeted for the intended users. This can also explain why some schools are not subscribing as their teachers may not be aware of SMC activities.

The trained resource reachers interviewed indicated that the support they receive from school heads could be used as an indicator on the usefulness and success of SMC organised workshops. Workshops run at the SMCs are mainly based on needs assessments and hence meet the needs of the teachers. This is very important as SMCs/workshops are intended to address teacher's needs so as to improve classroom practice.

Support to Access the SMC

Figure 3: How Authorities Support Teachers to Access SMCs

Resource Teachers	School Heads/ Heads Of Departments	Regional Directorate
• School heads give permission to attend SMC activities e.g. workshops • Schools pay subscriptions	• Grant teachers permission to attend SMC activities • Encourage teachers to visit SMC for resources • Provide travel and subsistence allowance when teachers go for workshops • Some provide transport for their teachers to attend workshops	• Facilitate by writing invitation letters to teachers • Assist with SMC advocacy in different fora

88.8% of the A-level teachers who responded to the questionnaire indicated that they received support in one way or another to access the SMCs. The kind of support received included transport, allowances when going for workshops, encouragement to visit SMCs and moral support. The teachers said they do not get any financial support when they visit the centre for resource materials. This explains why teachers are said to visit SMCs only for workshops and not for resources at the centres. During workshops, apart from participating, there is not be enough time for teachers to use the material at the SMCs. This shows that for teachers to visit SMCs for material use, they need financial support, especially when they have to travel for long distances.

Education officers assist by inviting participants for workshops, attending workshops and they sit on the management committee and the majority of them are in the treasury of the SMC. Some teachers are aware of SMCs workshops through invitations, but are not aware that there are other teaching resources at the SMCs. The invitation letters do not say anything beyond announcing the workshops. Teachers need to be told of other facilities at the SMCs.

Networking

The main means of communication is through letters, phones and reports. Only two out of ten regions have subject association. Teachers meet during workshops and this is the time they share their experiences. There is a very limited use of computers and Internet. This is partly because the Internet is always down, teachers are not computer literate or do not have time for computers as they only visit the SMC for workshops. Some computer literate teachers are not happy with the quality of computers at the centres and would prefer good quality computers. The results show that the networking of teachers is not as one would expect if teachers are to benefit from the system. Since teachers complain of distances and the fact that they are not given travel allowances when they visit the SMCs for materials, it would make sense to network the schools with computers. Electronic networking is a very important aspect which de-isolates teachers and minimises the shortage of textbooks.

Figure 4: Comments on Teachers' Professional Networking

Resource Teachers	School Heads/ Heads of Department	Regional Directorate
• Have not yet established effective communication system • The management has agreed to network schools • Planning is to come up with a newsletter for advocacy: communicate through letters, phones, reports, workshops, subject associations • Not much networking is done through the computer since most schools do not have the facilities	• Communicate through phones, meetings at SMCs and letters when inviting teachers for workshops • Use of e-mail is limited, there is need for computer literacy courses • Some schools have Internet, hence their communication is better and teachers can network with others	• Communicate through meetings with ZIMASE {This stands for?}, but difficulty to meet rural teachers • Schools with computers are not linked but individual teachers collaborate • There is no deliberate move towards networking, but they encourage subject associations

Development of Curriculum Materials

Figure 5: Acceptability of the Materials Writing Concept

Resource Teachers	School Heads/ Heads Of Departments	Regional Directorate
• Teachers know the problems to be addressed and they see it as a worthwhile activity • Materials will enhance student centred learning • There is a lot of potential that teachers will produce good materials if adequately trained • Process may be hindered by lack of resources and funds to finance the writing process • Teachers need incentives	• Have confidence in teachers producing their own materials • Writing process may be affected by financial constraints, lack of resources, lack of latest books/references to extract information, lack of writing time and failure by teachers to organise the writing process • A worthwhile activity being done by teachers themselves who know what they want and what will benefit the students • If there are too many writing meetings, heads may not be willing to release teachers so often • Teachers may fail to cope with the demands of the writing process • Some teachers may not see the need to share their context with others fearing that publication may come out of the materials and that their names may not appear	• Worthwhile activity and the materials produced can augment book shortages • Trained teachers can also train others so that there is a pool of writers • More funds are needed • There is a possibility that teachers will revert to their old ways of teaching rather than using the context based approach • May have problems of time and conducive environment • Involvement of Better Schools Programme Zimbabwe (BSPZ) may improve the production of materials • One regional director felt the materials development was a good idea and thought that some people in the ministry or at the university may take advantage of the system to further their qualifications

The A-level teachers indicated that locally produced materials are as good as imported materials. 80% of respondents, though they would appreciate local material, they do not want to be involved in the writing process. They prefer a team

of writers who are dedicated to producing the materials. Some individuals do not have faith in locally produced material. They think the teachers who are doing the materials development do not have relevant experience, and some of them are young teachers without higher professional qualifications. Some people are very sensitive on authorship.

Conclusions

The results show that most teachers visit the SMCs mainly for workshops which they found to be very useful. Teachers get transport allowance when they go for SMC organised workshops and not when they visit the SMCs for teaching materials. It was also established that there is a limited use of SMC materials which is largely due to lack of advocacy, financial constraints, prohibitive distances and computer illiteracy. However, the SMCs were found to be servicing the A-level science and mathematicss teachers. From the study, it is recommended that there be a full-time SMC attendant, teachers be afforded a chance to do computer literacy courses, management committees carry out advocacy campaigns targeted at intended users, set-up satellite centres and that management committees find ways of sustaining the running of the SMCs.

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